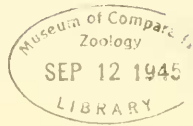


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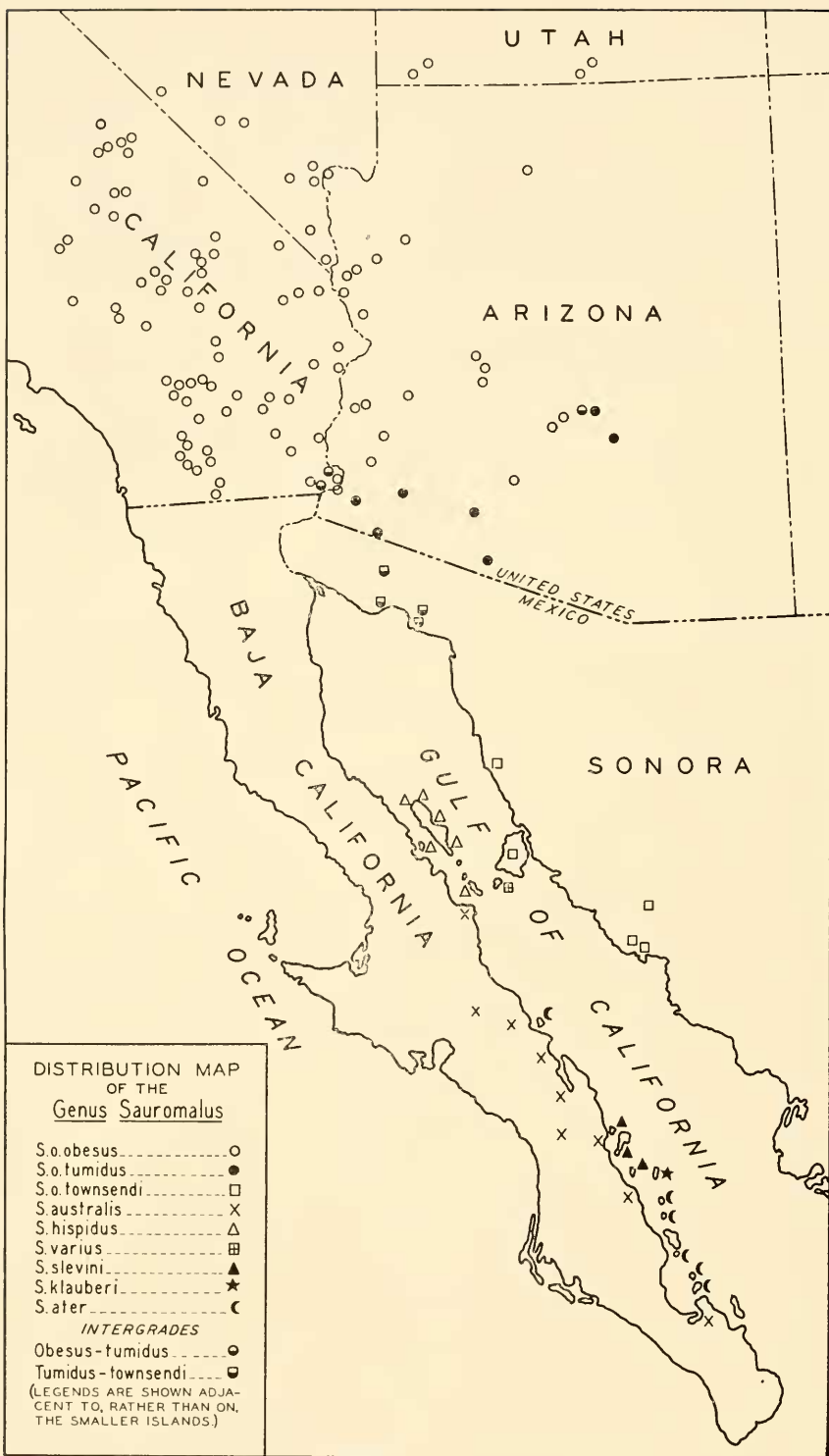
THE CHUCKWALLAS, GENUS SAUROMALUS

BY

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INTRODUCTION

Since the publication of Van Denburgh's "Reptiles of Western North America" more than twenty years ago, the genus *Sauromalus* has received but slight attention from herpetological workers. During this period important additional material from Arizona, Sonora, and Baja California has accumulated, which has made possible a better understanding of relationships within the genus and a more accurate determination of the distribution of the several species.

This study was begun at the suggestion of Dr. L. M. Klauber and was at first confined to the species *obesus*, in an attempt to determine whether any races were to be recognized within the range of this very widespread form. Because of certain nomenclatorial questions and the acquisition of several interesting specimens from Baja California, the scope of the study was extended to include the remaining species of the genus. However, the insular species of *Sauromalus*, with the exception of *ater* and *townsendi*, have been lightly dealt with in this paper as these are relatively static from a taxonomic point of view and probably will remain so. More intensive exploration of the islands in the Gulf of California may perhaps extend the ranges of one or two of the insular species, but the possibility that new species remain to be discovered is unlikely. The insular forms have been included here only for the sake of completeness.

HISTORICAL SUMMARY

The genus *Sauromalus* was established by Duméril in 1856 (Arch. Mus. Hist. Nat. Paris, vol. 8, p. 536) on the species *ater*, the type specimen having been presented to the Museum d'Histoire Naturelle in Paris without locality.

In 1858 Baird (Proc. Acad. Nat. Sci. Phila., vol 10, p. 253) with a series of specimens collected by the Mexican Boundary Survey and Lieut. Ives' Expedition, erected the genus *Euphryne* for the species *obesus*, which he described from Fort Yuma, California. For the next sixty-odd years *obesus* was referred to the synonymy of *ater*.

* At present in United States Marine Corps.

In 1891 Stejneger described *Sauromalus hispidus* (Proc. U. S. Nat. Mus., vol. 14, p. 409-411) from Angel de la Guarda Island, Gulf of California, Mexico. Stejneger distinguished *hispidus* from *ater*, with which it had been previously confused, on the basis of the former's more spinose and coarser scalation. At the same time this author also observed that a specimen of *ater* from Espíritu Santo Island, in the Gulf of California, exhibited certain differences from the *ater* of California and Arizona, differences that would have warranted its distinction at that time had more specimens from the island been available.

As a result of the collections made by the Albatross Expedition of 1911 to Baja California and its surrounding waters, Dickerson (Bull. Amer. Mus. Nat. Hist., vol. 41, pp. 463-465) described as new the following species of *Sauromalus*: *interbrachialis*, type locality, La Paz, Baja California, Mexico; *townsendi*, type locality, Tiburón Island, Gulf of California; and *varius*, type locality, San Estéban Island, Gulf of California. In describing *interbrachialis* from two additional specimens from Baja California, Miss Dickerson confirmed Stejneger's belief that the single specimen from Espíritu Santo Island available to him should be regarded as distinct from *ater* of further north in California and Arizona.

In 1922 Schmidt (Bull. Amer. Mus. Nat. Hist., vol. 46, pp. 640-641), observing the agreement in the number of ventral scale rows between the type specimens of *ater* and *interbrachialis*, referred the latter to the synonymy of *ater*, and revived Baird's name *obesus* for the chuckwallas occurring in the southwestern United States and northern Baja California. This author distinguished *obesus* from *ater* on the basis of a greater number of ventral scale rows between the gular fold and the anus in the former. In further justification of this revision, Schmidt (*loc. cit.*, p. 640) stated that "it is highly improbable that the type of *S. ater* Duméril, collected by Lieut. Jaurès during the circumnavigating voyage of the frigate Danaide, and presented without locality to the Museum d'Histoire Naturelle in Paris, could have been collected in California or Arizona, since *Sauromalus* does not reach the coast of California."

Van Denburgh in 1922 (Occas. Papers Calif. Acad. Sci., no. 10, vol. 1, pp. 97-99) described *S. slevini*, type locality, south end of Monserrate Island, Gulf of California, Mexico. This species was distinguished from *hispidus*, which it somewhat resembles, by its finer scalation and smaller size.

As a result of the present investigation, I described *S. klauberi*, (Trans. San. Diego Soc. Nat. Hist., vol. 9, 1941, pp. 285-288) type locality, Santa Catalina Island, Gulf of California, Mexico.

To these may be added two new forms described in this paper, *Sauromalus australis* sp. nov. from Baja California, and *Sauromalus obesus tumidus* subsp. nov. from southwestern Arizona.

VALIDITY OF CERTAIN NAMES

The fact that the type locality of *S. ater* is not known has been a source of confusion to previous authors as well as a considerable annoyance in the present work. Unfortunately the original description of *S. ater* gives no

diagnostic scale counts which would aid in the determination of the origin of the type specimen. From figure 3a accompanying the original description it can be seen that the nuchal scales are considerably smaller than the scales on the postauricular fold and are quite evenly disposed. This precludes the possibility of the type having come from any of the islands in the Gulf of California where *klauberi*, *slevini*, or *hispidus*, occur, for these forms have the nuchals usually at least as large as the postauricular scales; also *klauberi* has elongate nuchals interspersed with those of smaller size and is quite distinct from the other known forms of the genus in this respect.

Other sources of information concerning the type specimen have been employed in an effort to determine, as well as possible, the probable source of the type. Perhaps these references give as much, if not more, valuable information concerning the type specimen than the original description itself. A redescription is to be found in Bocourt "Mission Scientifique au Mexique," pp. 149-151, but again none of the characteristic scale counts, which might associate it with a more or less definite locality, are given. However, a clue to its probable origin, namely one of the several islands in the southern part of the Gulf of California north of La Paz, is given in the following color description: "Parties supérieures et inférieures de corps d'un brun jaunâtre, avec la tête, les pattes et la base de la queue d'un tinte un peu plus claire; le tronc est couvert en dessus de petites mouchetures noires." The yellowish-brown coloration referred to is present in nearly all of the specimens of *ater* and *slevini* which have been examined.

From "Contribution à la Faune Herpétologique de la Basse-California"* we have the following remarks by Mocquard: "L'un de nos spécimens, un mâle, offre en dessus, comme le type spécifique, une tinte fondamentale très sombre, sur laquelle on distingue assez difficilement une bande noire transversale, immédiatement en arrière de la racine des membres antérieurs." This evidence of only one band is not infrequent in the chuckwallas from the southern part of the peninsula of Baja California, as well as those from the islands off the coast.

Schmidt (*loc. cit.*, p. 640) from a photograph of the venter of the type specimen of *ater*, determined the ventral scale count to be about 135, a figure which corresponds excellently with the counts of the insular specimens. With these three sources of information, I believe that it can be definitely concluded that the type of *ater* came from one of the islands in the Gulf of California, where this species is now known to occur. The ventral count of 135, as determined by Schmidt, also fits *townsendi* and *klauberi* very well. But *klauberi* completely lacks any evidences of banding, being finely spotted instead; and *townsendi* is quite definitely banded with 4 solid, dark transverse bars across the back, a considerable period of preservation not having rendered these markings less distinct in the two specimens from Tiburón Island which have been examined. The coloration, as described by Mocquard, agrees excellently with some specimens of *slevini*, but the ventral count of 135 is much too high for that form; in 17 specimens of *slevini* the extreme range of variation in the ventral scale count was found to be 107 to 123 and the average 115.8.

* Nouv. Arch. Mus. Hist. Nat. Paris, ser. 4, vol. 1, pp. 302-303, 1899.

From the above facts it seems reasonable to assume the type locality of *ater*, hitherto unknown, to be one of the following islands in the Gulf of California: Espiritu Santo, Isla Partida, San Marcos, San Diego, Santa Cruz, or San Francisco.

Other counts which might be used to ascertain the probable locality of collection of the type of *ater* are the number of scales in a whorl around the tail two head-lengths behind the vent, and the number of scales around the upper part of the fore limb. Unfortunately present European conditions make the determination of these counts on the type of *ater* impossible.

We now come to the question of the validity of the name *interbrachialis* proposed by Dickerson for the chuckwallas occurring on Espiritu Santo Island and the southern portion of the peninsula of Baja California. The application of the name *ater* to the chuckwallas from Espiritu Santo Island makes *interbrachialis* invalid for that population. But as the type locality as given by Miss Dickerson for *interbrachialis* is stated to be La Paz, there remains the possibility that it should be applied to the mainland population in the event the latter should be proven distinct from the insular *ater*.

There have been available to me 6 specimens of *Sauromalus* from the southern part of the peninsula of Baja California. Although a slight degree of overlap in differential characters is shown between these specimens and 18 *ater* from the coastal islands of the southern Gulf, I believe the two populations to be distinct. And there are a number of reasons which seem to prevent the application of the name *interbrachialis* to the chuckwallas found on the mainland of Baja California.

Schmidt (*loc. cit.*, p. 640) remarks that "Two specimens of *Sauromalus* from La Paz are included in the collections of the Albatross Expedition. These are possibly from the island of Espiritu Santo, off La Paz, like the specimen recorded by Yarrow and Stejneger." Mr. Schmidt has informed me by letter that his reasons for doubting the localities of collection of these two specimens rest on the fact that some of the material was brought back alive to the New York Zoo, and, as Miss Dickerson also kept a number of living specimens, some confusion as to the proper place of origin was not unlikely under such circumstances. This fact together with the agreement in ventral scale counts between *interbrachialis* and *ater* led Schmidt to place the former in the synonymy of *ater*.

In connection with the type locality of *interbrachialis* it is interesting to note that the paratype was catalogued at the American Museum of Natural History as having been collected on Carmen Island in the Gulf of California, although Schmidt gives the locality of collection as La Paz. It should therefore, be referred to *slevini* rather than to *interbrachialis* or *ater*. Miss Dickerson made no mention of the source of the paratype in her description.

Dickerson separated *interbrachialis* from *ater* (*ater* being at that time the name applied to the chuckwallas in the United States as well as the southern portion of Baja California and the coastal islands) on the basis of its coarser scalation and because of the pattern of "double" dark transverse bands. Both the mainland chuckwallas and those from the islands off La Paz have this

double-barred pattern. With regard to the coarser scalation Miss Dickerson stated the ventral scale count to be 133, a figure which corresponds excellently with the counts of specimens from the southern coastal islands. In the chuckwallas from the peninsula I find that the ventral scale count in 6 specimens ranges from 151 to 186 and averages 163.5, while the counts of 18 *ater* from the islands range from 130 to 151 and average 139.7. In addition, Dr. Doris M. Cochran informs me that the type of *interbrachialis* has between 40 and 42 scales around the upper or humeral part of the fore limb, a count which fits most closely the counts of *ater*, with a range from 35 to 45, compared to 46 to 55 in the mainland specimens. These differences in countable scale series between the mainland chuckwallas and the insular *ater* seem to me to be sufficiently great to warrant the distinction of the former. In view of the agreement of the scale counts of the type of *interbrachialis* with the counts of the insular *ater*, and also because of the uncertainty of the locality of collection of the type of *interbrachialis*, I concur with Schmidt in placing *interbrachialis* definitely in the synonymy of *ater*. I am, therefore, describing the mainland population from southern Baja California as a new species, *Sauromalus australis*.

DIFFERENTIAL CHARACTERS

The characters which have been used to distinguish the several species of *Sauromalus* in this study are as follows:

- A. Pattern and color.
- B. Countable scale series.
 1. Ventral scale rows between the gular fold and the anus.
 2. The number of scales in a whorl around the tail two head-lengths behind the vent, hereafter referred to as caudals. A head length, as used here, is the distance from the anterior border of the ear opening to the tip of the snout.
 3. The number of scales around the upper part of the forelimb, hereafter referred to as humerals.
 4. The number of dorsal scales in a head length.
- C. Ratio of tail to total length.
- D. Size.

Pattern is useful in dividing the banded forms into two groups, one consisting of the forms *townsendi* and *obesus*, which have unicolor bands of dark-brown or black, as opposed to the forms such as *australis*, *ater*, *slevini*, and *hispidus* having the centers of the bands invaded by the ground color or considerably lightened, thus giving a double-banded effect. Of the remaining species, *klauberi* is distinguished by its pattern of fine spots, which have the appearance of being arranged in some semblance of longitudinal lines, while *varius* is characterized by its large, irregular dark blotches.

Of the countable scale series, the number of ventral scale rows between the gular fold and the anus has been most commonly used in distinguishing the species. Not infrequently it is difficult to arrive at the same count twice because of the irregularity and discontinuity of the scale rows. Also, when

making this count, care must be taken to begin the count at the edge of the anus and not to include the scales which enter a short distance into the vent.

As is the case with all of the countable characters, the ventral scale rows show an extreme range of variation both individually and geographically. The mainland forms in particular are the worst offenders in this respect, while the insular species fall comparatively close about the mean, this perhaps being due in a large part to their more uniform environment and to the relative crowding of the population into a small area.

To illustrate this point, insofar as the ventral scale count is concerned, the following statistical summary is offered. The specimens of *tumidus* are from Telegraph Pass, Gila Mts., Yuma County, Arizona. The specimens of *ater* and *slevini* are from all islands where these forms occur.

	<i>tumidus</i>	<i>ater</i>	<i>slevini</i>
Number of specimens	11	18	17
Extreme range	132-170	130-151	107-123
Mean	152.7	139.7	115.8
Standard deviation	12.53	6.45	5.76
Coefficient of variation, per cent	8.20	4.62	4.97

The number of caudal scales also shows considerable variation. Previously this count has been made "around the thickest part of the tail," but the hind limbs of some specimens frequently made a count in this region difficult. Also it seems best to make this count at a definite point two head-lengths behind the vent, as the thickest part of the tail may be of some extent, thus allowing room for variation in the count, depending upon the point in this region where the count is taken.

The humeral count is made at the middle of the upper part of the forearm. This is a rather difficult count to make, even in large specimens, because of the irregularity of the rows of scales around the arm. It is, however, of great value in distinguishing some of the forms.

The number of dorsal scales in a head length is determined by counting the number of dorsal scales in a head length at a point half way between the fore and hind limbs on the middorsal line. This character is most important in separating the two closely related species, *bispidus* and *slevini*.

During the early part of this study it was thought that the ratio of tail to total length would be of considerable significance in distinguishing several of the species, but this has proven not to be true. Certain of the species average much shorter tails than others, but the amount of overlap is too great to make this of any value diagnostically. However, it is interesting to note the considerable amount of intraspecific variation in this character. There is apparently no sexual dimorphism in this character.

Size is useful only in the identification of adults of such forms as *bispidus* and *varius*, which often reach a length in excess of 600 millimeters. *S. o. tumidus* has been found to have a greater average adult length than *S. o. townsendi*, to which it is closely related, and this character may be of use in some instances in distinguishing these two forms.

While chuckwallas in the southwestern United States and some of the islands in the Gulf of California are not uncommon and may even be abundant in certain areas, adequate homogeneous series for a statistical analysis have been found lacking. Chuckwallas are rather well represented in collections in this country, but for the most part they are from many scattered points in the southwest. This lack of material is probably due to a number of factors. One is the method of protection employed by these large lizards when seeking to escape their enemies, by running to a crevice in the nearest available boulder and there wedging themselves tightly by inflating their lungs, often making extrication impossible. Another reason, and perhaps the most important one, is the large size of these lizards and the consequent unwillingness of some collectors to "waste" often much-needed space and preservative on such relatively common creatures.

RELATIONSHIPS WITHIN THE GENUS

That the several species of *Sauromalus* are all very closely related must be apparent to those having only a slight degree of familiarity with them. Speciation has apparently centered upon changes in the degree of coarseness and spinosity of scalation and to a lesser extent changes in pattern. It is probable that the original center of distribution was what is now the central part of the Gulf of California and adjacent areas of Sonora and Baja California. With the advent of the geological disturbances which brought about the formation of the Gulf of California, the climatic changes resulting from these greatly altered conditions, and the splitting off of the islands from the Sonoran mainland and the peninsula of Baja California, speciation began.

The genus may be roughly divided into two groups, one consisting of the coarse-scaled species, *hispidus*, *slevini*, *klauberi*, *ater*, and *australis*, and the other group of *varius*, *townsendi*, *tumidus*, and *obesus*, which have relatively fine and less spinose scalation. It may be assumed that the formation of the Gulf of California was the original factor in separating the genus into two divergent lines, which have been carried on to the present. *Hispidus* and *varius* are apparently the oldest forms of the genus, their differentiation occurring before that of the other species, through the early breaking off, by faulting, of the islands upon which they now occur, *hispidus* being derived from a peninsular population, while *varius* was developed from a Sonoran population.

Because of their close relationship to *hispidus*, the forms *slevini* and *klauberi* are apparently the next to have been developed through insular isolation. These two species are coarse-scaled and quite spinose but not as much so as *hispidus*, nor do they attain the large size of that form. Probably both are derived from the same ancestral population, which also became separated from the mainland through geological disturbances. It appears that Santa Catalina Island, which is inhabited by *klauberi*, became separated from the ancestral population at an earlier date than did *slevini*, as *klauberi* has lost its transverse bands and has become finely spotted instead. The same trend in development is shown in *slevini*, of which two specimens have been examined, in which the normal complement of four bands has been reduced

to two, the remainder of the dorsal surface of the body being sprinkled with large brown spots.

S. ater has apparently been the last coarse-scaled form to develop through insular isolation in the series outlined above. It also seems likely that this species appeared at a relatively recent date, through the splitting off of a number of coastal islands from the peninsula of Baja California, as it is only slightly divergent from *S. australis*, which occupies the southern half of the peninsula.

Of the relatively fine-scaled forms, *varius*, *townsendi*, *tumidus*, and *obesus*, it is deemed probable that *varius* is the oldest by reason of its unique pattern of blotches.

S. o. townsendi, first described from Tiburón Island, has been found to occur also on the mainland in Sonora. This species intergrades with *S. o. tumidus* on the northwestern coast of Sonora, the two having similar scalation but very distinct adult patterns in the males. *S. o. tumidus* has apparently given rise to *S. o. obesus*, with which it intergrades in central Arizona and extreme southeastern California.

The following diagram represents my idea of the phylogeny of the genus:

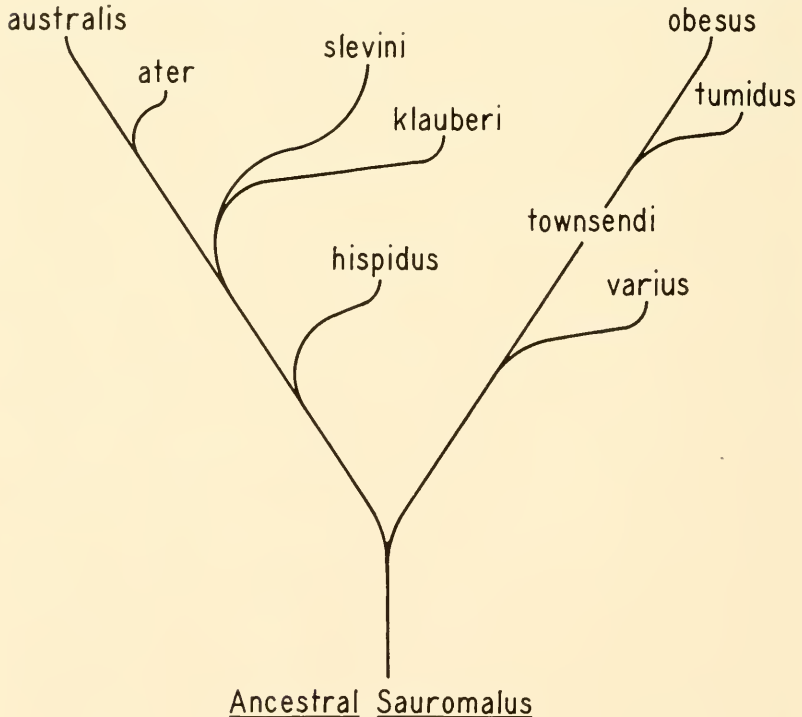


FIG. 1

DESCRIPTION OF SPECIES AND SUBSPECIES

Sauromalus hispidus Stejneger

SPINY CHUCKWALLA

Sauromalus ater Streets, Bull. U. S. Nat. Mus., no. 7, 1877, p. 36.

Sauromalus hispidus Stejneger, Proc. U. S. Nat. Mus., vol. 14, 1891, p. 409.

Type Specimen.—No. 8563 in the collection of the U. S. National Museum.

Type Locality.—Angel de la Guarda Island, Gulf of California, Mexico.

Distribution.—Angel de la Guarda, Smith, Pond, Granite, Mejía, and South San Lorenzo islands, Gulf of California, Mexico.

Diagnosis.—This is the coarsest-scaled, and, next to *varius*, the largest member of the genus. The largest nuchals are equal to, or larger than the largest plates on top of the head. The scalation of the limbs and tail is extremely spinose and more or less strongly carinate. Adult specimens are nearly uniform dark-brown or black above, while juveniles are transversely banded with dark-brown or black double bands.

Description.—Size large, form stout; head and body much depressed, the former nearly triangular in outline from above and wider than long in adult males, and longer than wide in females and juveniles. The top of the head is covered with irregular, rough plates, largest on the frontal and temporal regions, and becoming tubercular and spinose in the latter area. The nostrils open upward and outward in a single, rounded, raised plate much nearer the tip of the snout than the orbit. The superciliaries and supraoculars are small and juxtaposed, the latter tubercular and occasionally weakly spinose. There is a series of short, carinate suboculars, which, following the contour of the orbit, pass upward and backward to the anterior edge of the ear opening, in the form of more or less carinate plates. The labials are small and juxtaposed. The rostral plate is represented by four nearly equal hexagonal plates. The symphyseal plate is rather short, narrow and subtriangular. There are several series of enlarged sublabials which merge into the relatively coarse and spinose granular gular scales. There is a prominent gular fold covered with fine, feebly spinose scales. The ear opening is nearly vertical, with an anterior denticulation of from two to four enlarged spinose scales, the two central ones being the longest. There is a prominent lateral neck fold covered by enlarged, subconical, sharply spinose scales. The nuchal scales are quite large, some as large or larger than the frontal plates, strongly spinose and grading gradually into a broad median band of spinose dorsal scales which extends to the rump. The scales on the lateral fold are enlarged and each scale is provided with a short stout spine. The ventral scales are somewhat smaller than the median dorsals and are weakly spinose. There are from 108 to 129 rows of scales between the gular fold and the anus, averaging 121.4.

Dorsally, the scalation of the fore and hind limbs is extremely coarse, almost equaling the nuchal scales in size, and more or less strongly carinate and spinose. The humeral scales vary in number from 31 to 38 and average 35.6. The femoral pores range in number from 13 to 17 and average 14.9.

The tail is about equal in length to the head and body, varying from 49 to 53 per cent of the total length. The scalation is arranged in whorls, those ventrally being smooth and usually non-spinose while dorsally and laterally they are strongly spinose, especially towards the tip. The tail scalation is more or less strongly carinate except at the base. There are from 23 to 28 caudal scales in a whorl, averaging 25.5.

Coloration in Alcohol.—Adults: above, the general coloration is a dull olive-brown or nearly black with occasional evidences of irregular dark markings, especially between the shoulders and laterally near the insertion of the fore limbs. The ventral surface is yellowish- or grayish-brown and immaculate. The gular region of some specimens shows evidences of dark streaks or spots. Juveniles: the smallest specimen available is a sub-adult 390 mm. in length from S. San Lorenzo Island. This is nearly uniform dark-brown dorsally, but shows traces of one transverse band between the shoulders and another across the rump. The ventral surface is yellowish-brown with faint indications of a darker spotting. Schmidt (*loc. cit.*, pl. 50, fig. 2) figures a small specimen of this species which shows four transverse bands on the body and at least four bands on the tail. The ground color between the bands is light with an irregular spotting or streaking of darker color.

Remarks.—This species is apparently most closely related to *S. slevini*, which inhabits a group of islands further to the south in the Gulf of California. From *slevini*, *hispidus* may be distinguished by its much larger adult size and coarser, more spinose scalation. In *hispidus* the number of dorsal scales in a head length varies from 16 to 21 while the same count in *slevini* gives from 20 to 28 scales.

Habits.—Van Denburgh (*loc. cit.*, p. 101) remarks: "This chuckwalla was abundant in rocky canyons. They were found by looking for the spiny tails protruding from under rocks. On Pond Island they carried about great numbers of long sharp spines of a cactus, *Opuntia*, which grew in scattered clumps over the island and under which they ran for shelter. Several were found with spines sticking even into their eyes. All stomachs examined contained vegetable matter. On Granite Island, a small rock near the north end of Angel de la Guarda Island, many dead chuckwallas were found strewn about the tops of the osprey's nests."

Sauromalus slevini Van Denburgh

MONSERRATE CHUCKWALLA

Sauromalus slevini Van Denburgh. Occas. Papers Calif. Acad. Sci., no. 10, vol. 1, 1922, p. 97.

Type Specimen.—No. 50503 in the collection of the California Academy of Sciences.

Type Locality.—South end of Monserrate Island, Gulf of California, Mexico.

Distribution.—Monserrate, Carmen, and Coronados islands, Gulf of California, Mexico.

Diagnosis.—A medium sized chuckwalla, intermediate in scalation between *S. hispidus* and *S. ater*. From *hispidus* it may be distinguished by the greater number of dorsal scales in a head length (20-28) and the smaller size of the nuchal scales as contrasted with the plates on the frontal region. The ventral scale rows range from 107 to 123 and average 115.8.

Description.—Form stout; head and body much depressed, the former nearly triangular in outline from above, the latter very broad with a strong lateral fold. The top of the head is covered with small, smooth, juxtaposed plates largest on the frontal region. The nostril is pierced in a single rounded plate much nearer the tip of the snout than the orbit. There is a series of carinate suboculars much longer than high, which, posterior to the eye, pass upward and backward to the ear opening in the form of weakly mucronate tubercles. The rostral is divided into four small scales of equal size. The labial plates are small and subequal. The ear opening is vertical, or nearly so, with an anterior denticulation usually of two prominent spinose scales. Below the infralabials are several series of sublabials which grade into the granular gular scales. There is a strong gular fold. Immediately behind the ear opening there is a prominent lateral neck fold bearing many spinose, subconical scales. Above and slightly forward of the shoulder there is a fold bearing a small patch of enlarged, subconical scales. The nuchal scales are much larger than the median dorsal scales and are strongly spinose. Medianly, between the rump and the shoulders, there is a broad band of enlarged spinose dorsal scales. Laterally, between the median dorsal scales and the enlarged, stout, spinose scales of the lateral fold, the scalation is finer, spinose, and slightly imbricate. The ventral scales are somewhat smaller than the median dorsal scales, ranging in number from 107 to 123 and averaging 115.8.

Dorsally, the scales of the forelimb are quite large, mucronate and weakly carinate. The humeral scales vary in number from 30 to 37 and average 33.8. On the hind limb the scalation is also coarse, being coarsest on the tibial portion, mucronate and weakly carinate. The femoral pores vary in number from 12 to 18 and average 14.5.

The tail is depressed at its base and bears numerous whorls of scales, more or less strongly spinose and carinate everywhere except dorsally and ventrally at the base, there becoming smooth and very weakly spinose. In four specimens the caudals range in number from 22 to 23. The ratio tail to total length varies from .524 to .565.

Coloration in Alcohol.—Dorsally, the ground color of the body is yellowish-brown to dark-brown, the variation depending upon the age of the individual, adult specimens being nearly uniform dark-brown with faint irregular streaks and spots of darker brown or black faintly apparent. The top of the head is dark-brown or nearly black, becoming yellowish-gray on the sides. Younger specimens have a lighter brown ground color and are provided with from two to four prominent dark-brown double bands across the back.

Ventrally, the ground color is yellowish-brown. The gular region is spotted, streaked or marbled with dark-brown. Above, the tail is yellowish or olive-brown; below, a somewhat lighter brown.

Remarks.—While its coarse and spinose scalation indicates affinities with *hispidus*, *slevini*, on the basis of geographical grounds, together with similarities in scalation, shows a close relationship with *klauberi*, which inhabits Santa Catalina Island, only a few miles to the east of Monserrate Island.

Habits.—Nothing is known concerning the habits of this species, although they are presumably essentially the same as those of the other members of the genus.

Sauromalus klauberi Shaw

SPOTTED CHUCKWALLA

Sauromalus klauberi Shaw, Trans. San Diego Soc. Nat. Hist., vol. 9, no. 28, 1941, p. 285.

Type Specimen.—No. 6859 in the collection of L. M. Klauber.

Type Locality.—Santa Catalina Island, Gulf of California, Mexico.

Distribution.—Confined to the type locality.

Diagnosis.—Scalation moderately coarse, being intermediate between that of *S. slevini* and *S. ater*. The ventral scales number from 128 to 132 in the three known specimens. There are no transverse body bands, the dorsal surface of the body being sprinkled with small brown or black spots instead.

Description.—Form stout; the head and body much depressed, the latter broad with a strong lateral and gular fold. On top, the head is covered with small plates, largest on the frontal region. The supraoculars and superciliaries are small and juxtaposed. The nostril is pierced in a single rounded plate with raised edges, much nearer the tip of the snout than the orbit. The rostral is vertically divided into four small scales of equal size. The labial plates are small and subequal. The suboculars are short and carinate and, following the contour of the orbit, pass upward and backward to the anterior edge of the ear opening in the form of nearly round, feebly spinose plates. The ear opening is large and nearly vertical, with an anterior denticulation consisting of two adjacent strongly spinose scales bordered by two much smaller scales of the same shape. Immediately behind the ear opening is a prominent lateral neck fold bearing large, subconical, spinose scales interspersed with smaller scales of the same shape. The symphyseal is subtriangular and longer than wide. Below the infralabials are several series of sublabials which merge gradually with the very small and feebly spinose granular gular scales.

The nuchal scales are irregular in size, there being large, subconical, spinose scales scattered among much smaller scales of the same shape. The largest nuchals are somewhat smaller than the largest scales of the postauricular fold. Above the shoulder there is a group of enlarged spinose scales. There is a middorsal band of enlarged spinose scales extending from between the shoulders to the rump. Between the shoulders, this band of enlarged middorsal scales is bordered on each side by elongated and strongly spinose scales, irregularly distributed among those of much smaller size. Laterally, the scales are much reduced in size, imbricate, and spinose, becoming larger on the prominent lateral fold. The ventral scales are smaller than the median dorsals,

imbricate, and feebly spinose. The number of scale rows between the gular fold and the anus ranges from 128 to 132 and averages 130.3.

Dorsally, the scales on the fore limbs are large, spinose and weakly carinate; below, spinose to a slight degree and greatly reduced in size. The humeral scales vary from 36 to 39 and average 37.6. On the hind limbs the dorsal scales are also quite coarse, those of the tibial portion being largest, weakly mucronate, and carinate. The femoral pores range in number from 13 to 16 and average 14.3.

The tail is depressed at its base. The scalation is arranged in whorls of square or rectangular scales which are strongly spinose everywhere except at the base, where dorsally and ventrally they are only feebly spinose. There are 24 caudal scales in two specimens on which this count was made.

Coloration in Alcohol.—In adult specimens the ground color above is dark, becoming nearly black on the head. On the ground color of the dorsal surface of the body irregular black markings are present, but no tendency toward a banded arrangement is indicated. In a juvenile specimen the ground color of the dorsal surface of the body is gray, well sprinkled with small brown spots which have some semblance of arrangement into longitudinal rows. The gular region is spotted or streaked with brown. The chest is streaked with reddish-brown and the belly is immaculate, except along the edges, where small brown spots are faintly in evidence. The tail is uniform gray, dark-brown or greenish-brown, except at the base, where it may be flecked with yellow.

Remarks.—*S. klauberi* is most closely related to *S. slevini*, which occurs on Carmen, Coronados, and Monserrate islands, only a few miles to the north and west of Santa Catalina Island. Apparently *klauberi* became isolated from the ancestral population through geological processes which occurred at an earlier date than those which separated the islands on which *slevini* occurs, thus allowing sufficient time for development of such a distinctive character as the lack of transverse body bands. In general, the scalation is finer than that of *slevini*, especially on the limbs, and the heterogeneous arrangement of the nuchals and the elongated anterior dorsal scales are also peculiar to this form.

S. slevini may possibly be undergoing a similar evolutionary development at the present, for specimens have been examined which lacked the normal complement of four transverse body bands, two anterior bands being present and the remainder of the dorsal surface of the body sprinkled with large brown spots.

Habits.—*Klauberi*, like the other species of the genus, is herbivorous. Material taken from the large intestine of the three specimens has been identified as follows: leaflets of *Cercidium floridum*; fruits of *Euphorbia* sp.; parts of a spikelet of *Festuca* sp.; and leaves of *Acacia greggii*. The intestine of the type specimen also contained 14 unidentifiable hard-shelled seeds somewhat resembling a piñon nut in shape, but smaller.

Parasites.—The large intestine of each of the three specimens contained a large number of nematodes which, according to Dr. L. R. Penner, formerly of the Research Hospital of the San Diego Zoo, represent two or more new species of the genus *Alacuris*.

Sauromalus ater Duméril

ESPÍRITU SANTO CHUCKWALLA

Sauromalus ater Duméril, Arch. Mus. Hist. Nat. Paris, vol. 8, 1856, p. 536.

Sauromalus interbrachialis Dickerson (part), Bull. Amer. Mus. Nat. Hist., vol. 41, 1919, pp. 463-64.

Sauromalus ater Schmidt (part), Bull. Amer. Mus. Nat. Hist., vol. 46, 1922, pp. 640-41.

Type Specimen.—In the collection of the Museum d'Histoire Naturelle, Paris.

Type Locality.—Not definitely known but undoubtedly one of the several islands in the southern part of the Gulf of California where this species is known to occur.

Distribution.—Espíritu Santo, Isla Partida, San Francisco, San Diego, Santa Cruz, and San Marcos islands, Gulf of California, Mexico.

Diagnosis.—Similar to *S. australis*, inhabiting the adjacent peninsula, but distinguished from that form by its somewhat coarser scalation with correspondingly lower scale counts. The number of ventral scale rows between the gular fold and the anus varies from 130 to 151, averaging 139.7; humeral scale count ranging from 35 to 45 and averaging 40.2.

Description.—Form stout; head and body depressed, the former nearly triangular in outline from above and as wide or wider than long in adult males, and longer than wide in adult females and juveniles. Above, the head is covered with small, rounded, non-imbricate plates, largest in the frontal and parietal regions. The supraoculars and superciliaries are small and juxtaposed. The nostril is pierced in a single rounded plate with raised edges directed upward and slightly backward, much nearer the tip of the snout than the orbit. There is a series of large, weakly carinate suboculars which, posterior to the eye, pass slightly upward and backward to the anterior border of the ear opening in the form of enlarged tubercles. The rostral is occasionally entire but is more frequently represented by four hexagonal scales of equal size. The symphyseal is long and subtriangular. The ear opening is vertical, or nearly so, with an anterior denticulation consisting of two to five long, spinose scales. Behind the ear opening there is a prominent crescent-shaped neck fold which is covered with many tubercles or subconical spines. The lips are bordered by short, subequal plates. Below the infralabial plates are several series of sublabials which become successively smaller as they merge with the granular gular scales. There is a prominent gular fold.

The nuchal scales are somewhat larger than the largest median dorsal scales and much smaller than the plates on the frontal region. The nuchal scales may be tuberculate and spinose or simply flattened with an obtuse posterior spine. There is a broad series of enlarged, feebly spinose, median dorsal scales which are rectangular in shape, extending from the nuchals to the rump. Laterally, the scalation is much reduced in size, spinose and slightly imbricate. The scales on the strong lateral fold are nearly as large as the median dorsals and are provided with a short, stout spine. The ventral scales

are slightly smaller than the median dorsals and are occasionally feebly spinose. There are from 130 to 151 rows of scales between the gular fold and the anus, averaging 139.8.

Dorsally, the scalation of the fore limb is coarse and obtusely spinose. Below, the scales are very much reduced in size and are granular. The number of humeral scales varies from 35 to 45 and averages 40.2. On the hind limb the scalation is quite coarse, the dorsal tibial scales being largest, mucronate and weakly carinate. Below, much reduced in size. The femoral pores vary in number from 17 to 21 and average 18.7.

The tail is depressed at its base and ranges from 50 to 55 per cent of the total length. The scalation is coarse and arranged in whorls, the posterior three-fourths being strongly keeled and spinose, the anterior one-fourth relatively smooth and less strongly spinose dorsally and ventrally, becoming feebly spinose laterally. There are from 24 to 33 caudal scales in a whorl, averaging 28.3.

Coloration in Alcohol.—The ground color of the dorsal surface of the body is dull yellowish-brown or occasionally grayish-brown. The top of the head is dark-brown, usually becoming somewhat lighter on the sides. There are four broad transverse bands across the back. In juveniles a fifth band is usually present on the nape. The centers of the transverse bands are invaded by the light ground color, the dark-brown or black anterior and posterior borders presenting a double-barred effect. Middorsally, between the bands, the ground color is yellowish and is spotted with brown or black. The gular region and the chest are a dull gray or brown and more or less obscurely marbled, streaked, or spotted with brown or black. The venter is grayish- or yellowish-brown spotted with brown laterally. There are four or five dark-brown bands encircling the tail with areas of yellowish-brown between. The limbs are grayish- or yellowish-brown spotted with dark-brown.

Variation.—The following is a summary of the countable scale series in this species:

	<i>Ventrals</i>	<i>Caudals</i>	<i>Humeral</i> s
Number of specimens	18	9	17
Extreme range	130-151	24-33	35-45
Mean	139.7	28.3	40.2
Standard deviation	6.45	3.95	2.59
Coefficient of variation, per cent	4.62	14.0	6.44

It will be seen that the coefficient of variation is relatively small in this species, compared to such mainland forms as *townsendi* and *obesus*, thus indicating narrower limits of dispersion for these characters and making them more reliable diagnostically. The specimens from which the above counts were obtained were from all islands where this species occurs, as sufficient material from a single island was not available.

Remarks.—*S. ater* is apparently most closely related to *S. australis*, which inhabits the southern part of the Gulf coast of the peninsula of Baja California. *Ater*, however, has a more coarse and spinose scalation than *australis* and in this respect shows an approach to *slevini*, especially in the spinose character of the nuchal and post-auricular regions. The majority of specimens of *ater*

differ in general coloration from *australis* in that they are yellowish-brown. However, LMK 3855 from Espiritu Santo Island has a grayish-brown ground color, in which respect it is similar to the mainland *australis*.

A specimen of *Sauromalus*, CAS 51465, from San Marcos Island, some 150 miles north of Santa Cruz Island, the northernmost of the southern group of islands where *ater* occurs, is here referred to this species, as the ventral scale count of 140 agrees with those of the specimens from the islands further south. This makes for an erratic distribution, as the islands on which *klauberi* and *slevini* occur destroy the geographical continuity of the distribution of *ater* by inserting themselves between Santa Cruz and San Marcos islands. The occurrence of this species in such widely separated areas seems to support the idea that *ater* has but recently become differentiated from a peninsular form by the splitting off of the several islands on which it now occurs. However, the single specimen from San Marcos Island seems to have a more oval shaped head in outline from above and a more truncate snout than the other specimens of *ater* which have been examined, and additional specimens from that locality may possibly disclose further differences which would warrant its distinction as a separate species.

Sauromalus australis sp. nov.

PENINSULAR CHUCKWALLA

Sauromalus ater Mocquard (part), Nouv. Arch. Mus. Hist. Nat. Paris, ser. 4, vol. 1, 1899, p. 302.

Sauromalus obesus Schmidt (part), Bull. Amer. Mus. Nat. Hist., vol. 46, 1922, p. 641.

Type Specimen.—An adult male, No. 30170 in the collection of L. M. Klauber; collected at San Francisquito Bay, Baja California, Mexico, July 30, 1938, by Robert S. Hoard. The following five paratypes have also been examined: LMK 30168, Loreto; LMK 30169, 33 mi. north of Canipole; CAS 53710, Agua Verde Bay; SDSNH 17707, Comondú; SDSNH 17708, La Paz.

Specimens which undoubtedly represent this species are recorded by Mocquard (*loc. cit.*) from Santa Agueda, San Ignacio, and Mulegá.

Diagnosis.—Scalation moderately coarse, being intermediate between that of *S. ater* and *S. o. obesus*, but somewhat finer and less spinose than that of *ater*. From *obesus* it may be distinguished by the transverse bands, the centers of which are invaded by the lighter ground color, the dark-brown or black anterior and posterior borders giving a double-barred effect. The ventral scale rows vary in number from 151 to 186 and average 163.5. The humeral scales range in number from 46 to 55 and average 49.0.

Description of the Type.—Form stout; head and body depressed, the former with a greatly swollen temporal region which curves rather abruptly inward to a narrow, pointed snout. Above, the head is covered by small, smooth, juxtaposed plates, largest on the frontal and parietal regions and becoming tuberculate and feebly spinose in the latter area. The nostril is

pierced in a single rounded plate directed upward and outward, much nearer the tip of the snout than the orbit. The superciliaries are small and juxtaposed. There is a series of carinate suboculars, which, posterior to the orbit, pass upward and backward to the anterior border of the ear opening. The rostral is vertically divided into four scales of equal size and shape. The labial plates are all short and subequal. There are several series of sublabials which merge into the finely granular gular scales. There is a well-defined gular fold. The ear opening is nearly vertical, with an anterior denticulation of four strongly spinose and elongate scales.

Medianly, the nuchal scales are roughly triangular in outline and are provided with a short obtuse spine. Laterally the nuchal scales become subconical or tuberculate and more conspicuously spinose. Posterior to the ear opening there is a prominent lateral neck fold which bears strongly spinose subconical scales. There is a median band of enlarged dorsal scales. Anteriorly, between the shoulders, these are rather sharply spinose, becoming less so posteriorly. Laterally, the scalation is finer, becoming coarser and more spinose on the strong lateral fold. The ventral scales are smaller than the median dorsals, smooth, imbricate and feebly spinose. There are 151 rows of scales between the gular fold and the anus.

On the fore limb the scalation is coarse, obtusely spinose and weakly carinate. There are 46 humeral scales. On the hind limb the scalation is coarsest on the tibial portion, carinate and obtusely spinose. The scales of the dorsal surface of the foot are sharply spinose. The femoral pores number 18-19.

The tail is depressed at its base and covered with whorls of rectangular, carinate and more or less strongly spinose scales, except at the base where dorsally and ventrally they are smooth and only very feebly spinose. The caudal scales number 36. The ratio of tail to total length is .558.

The ground color of the top of the head is dark-brown, becoming yellowish on the frontal region. The scales on the parietal region are tipped with gray. Immediately anterior to the ear opening there is a dark-brown blotch. The labials are gray or white. The gular region is gray with irregularly disposed streaks or spots of dark-brown. Dorsally, the ground color of the body is a light-gray with indications of four transverse bands of black or reddish-brown which do not meet on the median line. The band between the shoulders is most prominent and is spotted or streaked with gray through its long axis, thus giving a double-barred effect. Between the transverse bands are small spots of brown or black. The chest and the undersides of the forearms are gray, spotted or streaked with brown or black. The tail is an immaculate yellowish-brown with faint indications of four darker encircling bands. This color description is of the type specimen as preserved in alcohol.

Variation.—As in the other mainland forms of *Sauromalus* a considerable amount of variation in both coloration and scalation is exhibited by *S. australis*. SDSNH 17708 from La Paz possesses only two transverse bands, like some specimens of *slevini* which have been examined. The band between the shoulders is indicated by the black spotting and streaking which overlies a

dark-gray ground color. The band posterior to this is evident only as a closer grouping of many small black spots.

Usually the coloration of *australis* differs from that of *ater* in being gray instead of yellowish-brown, although CAS 53710 from Agua Verde Bay has the coloration of the majority of the specimens from the islands.

The following is a summary of the variation in countable scale series in this species, as well as a comparison of these counts with those of *ater*:

	<i>australis</i>	<i>ater</i>
Ventrals	151-163.5-186*	130-139.8-151
Humeralis	46-49.0-55	35-40.2-45
Caudals	32-34.7-37	24-28.3-33

Remarks.—*S. australis* is clearly most closely related to *S. ater*. It may be distinguished from *ater*, however, by its generally finer scalation and by its lack of the degree of spinosity achieved by *ater*. It seems probable that *australis* is the end form of a once widespread species that became differentiated into the species now found on the islands in the Gulf of California.

The relationship between *australis* and *obesus* is uncertain at this time because of the lack of material from between San Francisquito Bay on the south and the U. S.-Mexican boundary on the north. However, when more collecting has been done in this region, the ranges of these two forms will probably be found to overlap with no intergradation present, for they are apparently quite distinct from one another despite the overlap shown in countable scale series.

Habits.—Presumably essentially the same as the other members of the genus.

Sauromalus varius Dickerson

PIEBALD CHUCKWALLA

Sauromalus Townsend, Bull. Amer. Mus. Nat. Hist., vol. 35, 1916, p. 428.

Sauromalus varius Dickerson, Bull. Amer. Mus. Nat. Hist., vol. 41, 1919, p. 464.

Type Specimen.—No. 64441 in the collection of the U. S. National Museum.

Type Locality.—San Estéban Island, Gulf of California, Mexico.

Distribution.—Confined to the type locality.

Diagnosis.—This very interesting species may be most easily distinguished from the other members of the genus by its large size and by its peculiar pattern of large irregular reddish-brown blotches on a yellowish ground color.

Description.—Size large, adults sometimes reaching a length in excess of 600 millimeters. Head and body much depressed, the latter very broad. From above, the head is nearly triangular in outline, broader than long in adult males and longer than broad in females and juveniles. The top of the head is covered

* The outer figures indicate the extremes; the central figure the mean.

with smooth, irregular plates, largest on the frontal and parietal regions, and becoming tubercular in the latter region. The nostrils open upward and somewhat backward in a single oval, raised plate, much nearer the tip of the snout than the orbit. The superciliaries and the supraoculars are small and juxtaposed. There is a series of short, smooth suboculars which, following the contour of the orbit, pass upward and backward to the anterior border of the ear opening. The labials are quite small and juxtaposed. The rostral plate is divided into four subequal hexagonal plates. The symphyseal is long and narrow. There are several series of enlarged sublabials which merge with the granular gular scales. There is a prominent gular fold. The ear opening is nearly vertical with an anterior denticulation, usually of two short and bluntly spinose scales. There is a lateral neck fold posterior to the ear opening covered by very small tubercular or subconical scales. The nuchal scales are not greatly enlarged; they are short, and tubercular or subconical, and only very feebly spinose, grading into a median band of relatively large feebly spinose dorsal scales which extend to the rump. Laterally the scalation becomes finer and somewhat granular with short blunt spines. The scalation on the strong lateral fold is somewhat enlarged and is bluntly spinose. The ventral scales are smaller than the median dorsals and may be feebly spinose, especially on the chest. There are from 150 to 165 rows of scales between the gular fold and the anus, averaging 158.5 in 11 specimens.

Dorsally, the scalation of the forelimbs is relatively coarse, the individual scales being as large or larger than the largest nuchal, weakly spinose and very faintly carinate. Below, they are much reduced in size and are granular. The humeral scales range in number from 52 to 58 and average 54.3. On the hind limb the scalation of the femoral portion is relatively fine, increasing in size on the tibial part of the leg but not quite as coarse as the dorsal scalation of the forelimbs, occasionally weakly carinate and feebly spinose. Below, the scales are much reduced in size and weakly spinose. There are from 15 to 18 femoral pores, averaging 16.1.

The tail ranges in length from 50 to 56 per cent of the total length. The scalation is arranged in whorls of smooth and weakly spinose scales, except dorsally towards the tip where they become more sharply spinose and faintly carinate. The caudal scales range in number from 30 to 35 and average 32.0.

Coloration in Alcohol.—The ground color is usually yellowish or occasionally orange-brown with irregular blotches and spots of reddish-brown or black on the tail and body. Generally, the snout, chin, and the top of the head are black or nearly so.

Remarks.—The ancestry of *varius* cannot be traced directly to any living species of the genus. Apparently this form became isolated at a very early date from a mainland population in Sonora, which later gave rise to *townsendi*, and its long period of separation has allowed sufficient time for the development of such distinctive characters as its irregular blotching, large size, and relatively fine, smooth scalation.

Habits.—Regarding this lizard Van Denburgh (1922b, p. 103) says: "These huge lizards were abundant in the dry washes and small rocky canyons

of San Estéban Island. Here they lived under rocky ledges and piles of lava. Numerous droppings about the mouths of their dens, and often their protruding tails, made it easy to find them. They were easily captured by pulling them out of their retreats by their tails, and made no attempt to bite when caught. Five were found in a compact mass in the center of a patch of *Opuntia*."

Schmidt (1922, p. 643) states: "Large numbers of the big spotted lizards of the species, as well as of *Ctenosaura hemilopha*, were conspicuous, and were secured by pulling them out from under the rocks where they took refuge, or by turning over the rocks. Dr. J. N. Rose, who was a member of the party, has kindly identified the stomach contents of three specimens. He writes: 'The contents of two stomachs are entirely made up of the flowers of *Pachycereus pringlei* Britton and Rose. The third stomach is also largely filled with this cactus flower, but also contains numerous small leaflets of some leguminous plants, probably some *Cercidium*'."

These large lizards, when on display in an outdoor pit at the San Diego Zoo, apparently do very well on a diet of lettuce, bananas, tomatoes, apple, cabbage, and the yellow blossoms of the Palo Verde trees which grow in the pit.

Sauromalus obesus townsendi Dickerson

SONORAN CHUCKWALLA

Sauromalus ater Belding (part), West Amer. Sci., vol. 3, no. 24, 1887, p. 97.

Sauromalus townsendi Dickerson, Bull. Amer. Mus. Nat. Hist., vol. 41, 1919, p. 464.

Type Specimen.—No. 64442 in the collection of the U. S. National Museum.

Type Locality.—Tiburón Island, Gulf of California, Mexico.

Distribution.—Tiburón Island and the adjacent Sonoran mainland at least as far south as Guaymas and east to the vicinity of Hermosillo.

Diagnosis.—A small chuckwalla distinguished from *S. o. tumidus* by the lack of reddish coloration in the males and also by somewhat coarser scalation, with correspondingly lower average scale counts.

Description.—Form stout; head and body depressed, the former as wide or wider than long in adult males and longer than wide in females. The top of the head is covered with small and more or less convex plates, largest on the frontal and parietal regions, becoming tuberculate and occasionally weakly spinose in the latter area. The supraoculars and superciliaries are small and juxtaposed. The nostril is pierced in a single rounded plate much nearer the tip of the snout than the orbit. The rostral plate is usually vertically divided into from two to four scales of equal size and shape, although these may be sometimes united to form a single hexagonal plate much wider than high. There is a series of weakly carinate suboculars, which posterior to the eye pass upward and backward to the ear opening in the form of more or less mucronate tubercles. The labial plates are small and subequal. Below the infralabial plates are several series of enlarged sublabials which change gradually into the granular

gular scales. There is a strong gular fold. The ear opening is vertical, or nearly so, with an anterior denticulation usually consisting of from two to four strongly spinose scales. Behind the ear opening there is a lateral neck fold covered with many large subconical or tubercular scales which are strongly spinose in most males, but less so in females. The nuchal scales may be subconical and strongly spinose or simple flattened squares with one corner projected into a spine. From the rump to the shoulders there extends a broad median band of spinose dorsal scales. Laterally, the scalation is much reduced in size, imbricate and spinose, becoming enlarged and strongly spinose on the prominent lateral fold. The ventral scales are somewhat smaller than the middorsal scales and may be feebly spinose. The number of scales between the anus and the gular fold varies from 138 to 157 and averages 148.7 in 11 specimens.

Dorsally, the scalation of the forelimb is quite coarse, spinose and occasionally weakly carinate; below, much reduced in size and granular. There are from 37 to 45 scale rows around the humeral part of the arm, averaging 40.4.

Dorsally, the scalation of the femoral portion of the hindlimb is coarse and obtusely spinose, increasing in size on the tibial portion and usually strongly spinose and carinate.

The tail varies in length from 49 to 55 per cent of the total length and is depressed at its base. The caudal scales are arranged in whorls, usually strongly spinose and carinate everywhere except at the base, where dorsally and ventrally they become smooth and very weakly spinose. There are from 27 to 30 caudal scales in a whorl two head lengths behind the vent, averaging 28.5 in 11 specimens.

Coloration in Alcohol.—The top of the head is light-brown to yellowish-gray. There is a very prominent dark spot just behind the ear. There are from 4 to 5 dark-brown transverse dorsal bands between the nape and the rump, more or less distinct, and spotted or irregularly streaked with gray. Between the bands there may be well-defined lines of light-yellow on the grayish or yellowish ground color. The ground color of the gular region and the belly varies from yellowish to gray with occasional peppering of fine black spots. The limbs are brownish or gray with spots of yellowish-brown or gray upon them. The tail is gray or yellowish-brown with four or five dark-brown or nearly black encircling rings.

Variation.—The following is a summary of the countable scale series in the available specimens of this subspecies:

	<i>Ventrals</i>	<i>Caudals</i>	<i>Humerals</i>
Range	138-157	27-30	37-45
Mean	148.7	28.5	40.4
Standard deviation	6.37	.69	6.55
Coefficient of variation, per cent	4.29	2.41	16.21

As with the other forms of *Sauromalus*, there is a noticeable variation in pattern and coloration. Specimens from the Sonoran mainland have a grayish ground color with nearly black transverse bands, while those from Tiburón

Island have a yellowish ground color and brown transverse bands. Some of the mainland specimens have the transverse bands reduced to only the faintest indications and in this respect are similar to some specimens of *S. australis* from Baja California.

Remarks.—By reason of its coarse and spinose scalation, *townsendi* is apparently quite closely related to *S. o. tumidus*. The larger size and usually brilliant reddish dorsal and ventral suffusion of the adult males of *tumidus*, together with the higher average scale counts in this form, will serve to distinguish it from *townsendi*.

The following is a comparison of scale counts in these two forms:

	<i>townsendi</i>	<i>tumidus</i>
Number of specimens	11	31
Ventrals	138-148,7-157	132-159,4-190
Caudals	27-28,5-30	29-32,4-37
Humeral	37-40,4-45	39-44,6-50

In the specimens of *tumidus* and *townsendi* which have been examined, there is a quite noticeable difference in size. In 22 adult specimens of *tumidus* with complete tails, the average total length was found to be 325 mm., while 5 adults of *townsendi* with complete tails averaged only 285 mm. in length.

Specimens from the northwestern coast of Sonora in the vicinity of Las Chollas Point and Punta Peñasco are considered intergrades between *tumidus* and *townsendi*, as they have the coloration of the latter and the scalation of the former.

Localities of Collection.—SONORA, MEXICO: Tiburón Island (type locality); Cerro Prieta, 3 mi. nw. of Puerto de Lobos; 5 mi. n. of Guaymas; Miramar, 3 mi. nw. of Guaymas; San Carlos; Guaymas; 1 mi. w. of Empalme; 54 mi. sw. of Hermosillo.

Sauromalus obesus tumidus subsp. nov.

GILA CHUCKWALLA

Sauromalus obesus Gloyd (part), Bull. Chi. Acad. Sci., vol. 5, no. 5, p. 106, 1937.

Type Specimen.—An adult male, No. 27323 in the collection of L. M. Klauber; collected at Telegraph Pass, Gila Mountains, Yuma County, Arizona, June 15, 1937, by L. M. Klauber. The following twelve paratypes are also available from the same locality: LMK 8613; LMK 27551; LMK 33170-75; LMK 33224-25; LMK 34141; LMK 35090.

Diagnosis.—A relatively large chuckwalla distinguished from *S. o. obesus* by its coarser and generally more spinose scalation, especially on the limbs and tail. From *S. o. townsendi* it may be segregated by the brilliant red dorsal and ventral coloration of the males, by its higher average scale counts, and by its larger adult size.

Description of the Type.—Form stout; head and body depressed, the former with a greatly swollen temporal region which curves abruptly inward to

a narrow, pointed snout. Above, the head is covered by small, smooth, juxtaposed plates, largest on the frontal and parietal regions and becoming tuberculate and feebly spinose in the latter area. The nostril is pierced in a single rounded plate directed upward and outward, much nearer the tip of the snout than the orbit. The superciliaries are small and juxtaposed. There is a series of carinate suboculars, which, posterior to the orbit, pass upward and backward to the anterior border of the ear opening. The rostral is vertically divided into four scales of equal size and shape. The labial plates are numerous and subequal. There is a series of sublabials which merge gradually with the granular and subconical gular scales. There is a well-defined gular fold. The ear opening is nearly vertical with an anterior denticulation of three strongly spinose and elongate scales.

The largest nuchals are somewhat smaller than the plates on the frontal region, somewhat triangular in outline and more or less strongly spinose. Posterior to the ear opening there is a prominent lateral neck fold which bears strongly spinose subconical scales. There is a median band of enlarged dorsal scales. Anteriorly, between the shoulders, these are rather sharply spinose, becoming less so posteriorly. Laterally, the scalation is finer, becoming coarser and sharply spinose on the strong lateral fold. The ventral scales are smaller than the median dorsals, smooth, imbricate, and feebly spinose. There are 132 rows of scales between the gular fold and the anus.

On the forelimb the scalation is coarse, obtusely spinose and weakly carinate. There are 40 humeral scales. On the hindlimb the scalation is coarsest on the tibial portion, carinate and obtusely spinose. The scales of the dorsal surface of the foot are sharply spinose. The femoral pores number 16 on the left leg, those on the right leg having been injured.

The tail is depressed at its base and covered with whorls of rectangular, carinate and more or less strongly spinose scales, except at the base where dorsally and ventrally they are smooth and only very feebly spinose. The caudal scales number 32. The ratio of tail to total length is .499.

The head, nape, chest, gular region, forelimbs, hindlimbs, and groin are black with an irregular spotting of yellow on the nape and on the fore limbs. The middorsal region is suffused with red and generously flecked with yellow and black spots. The ventral surface is red and irregularly spotted with black. The tail is an immaculate yellowish-brown with no trace of encircling bands. This color description is of the type specimen as preserved in alcohol.

Variation.—*Tumidus*, like *obesus*, exhibits considerable variation in both coloration and scalation. There is a marked sexual dimorphism in the adults. In specimens from Yuma County, Arizona, nearly all of the males have lost their juvenile pattern of well-defined transverse bands, except for the prominent black band across the rump and between the shoulders. In most cases the tail rings are retained. In the majority of males the head, neck, shoulders, gular region and forelimbs as well as the hindlimbs, rump and groin are jet-black with an occasional flecking of gray or white. The ground color of the dorsal surface of the body is yellowish-gray, well spotted with large amounts of black and red, the former color becoming more prevalent laterally. The belly is brick-red

spotted with black. The tail is grayish or straw-color with or without indication of darker rings. LMK 34141 from the Gila Mts. has the red and black on the dorsal surface of the body arranged into reticulations, making a most striking and beautiful specimen.

The following color notes describe a live adult male taken at Telegraph Pass, Gila Mts., Yuma County, Arizona: The head, gular region, chest, neck and forelimbs together with the hindlimbs, rump and groin are Black.* The neck, forelimbs and rump are flecked with Deep Olive Gray. The ground color of the dorsal surface of the body is Deep Olive Gray finely spotted with Black and Dragon's Blood Red. The belly is Vinaceous-Rufous finely spotted with Ivory Yellow laterally. There are four tail rings of Pale Olive Gray with interspaces of Pale Olive Buff.

The coloration of the females is a brownish-gray with 1 to 4 well-defined transverse body bands. The bands may be finely spotted with gray, but are usually a unicolor black or brown with a lighter spotting on the ground color between. There are usually four dark-brown rings on the tail with yellowish or brownish interspaces.

In female *tumidus*, there is a pronounced tendency toward the reduction of the number of transverse bands from the normal number of four to as few as one. Chi.A.S. 10133-34 from 4 miles w. of Superior, Arizona, are excellent illustrations of this trend, the former having only a single band anteriorly just behind the shoulders, the remainder of the dorsal surface being finely spotted with brown, while the latter has only two transverse bands. The majority of the female *tumidus* also have the transverse bands considerably widened middorsally and tapering sharply on the sides.

A tendency toward melanism in *tumidus* is shown by an intergrade from near Apache Junction, Pinal County, Arizona. In life this specimen is jet-black in color, except for the tail, which was straw-yellow. Upon preservation in alcohol the presence of three dark-gray rings on the tail became apparent. The same condition is also approached in Chi.A.S. 9481 from 4 mi. w. of Superior, Pinal County, Arizona, except for a grayish spotting of the middorsal region. Chi.A.S. 9482 is also nearly solid-black except for a lightening of the middorsal region and a grayish spotting on the gular region and the chest.

In general, the majority of the adult male *tumidus* have a reddish dorsal and ventral suffusion, with at least an indication of one or two transverse dorsal bands, while the females are a drab grayish-brown in color and retain their transverse bands throughout life.

In scalation the variation is also considerable. The following is a summary of counts based on 21 specimens from several localities in Yuma County, Arizona.

	<i>Ventrals</i>	<i>Caudals</i>	<i>Humerals</i>
Range	132-185	29-36	39-49
Mean	156.6	32.5	44.0
Standard deviation	13.67	1.71	3.32
Coefficient of variation, per cent	8.73	5.29	7.55

* Capitalized colors refer to Ridgway's *Color Standards and Nomenclature*, 1912.

Tumidus also shows considerable variation in its generally spinose character. Usually the nuchals and scales on the lateral neck fold are quite spinose as well as the scales on the tail. Some individuals, however, lack the spinose development achieved by many of the others and in this respect resemble the majority of specimens of *obesus*. Some specimens carry the development of spines to an extreme. SDSNH 16480, an intergrade between *tumidus* and *townsendi*, from Las Chollas Point, Sonora, has nearly every scale on the body and tail provided with a sharp spine and in this respect is just as spinose as *hispidus*, although lacking the coarse scalation of that species.

Remarks.—*S. o. tumidus* is apparently most closely related to *S. o. townsendi* in characters of scalation, while it shows a tendency toward *obesus* in pattern and coloration. *Tumidus*, like *townsendi*, has a relatively coarse scalation, but its larger size and the distinctive coloration of the males readily distinguish it from the form occurring further south in Sonora.

Because of the presence of intergrades between *tumidus* and *obesus* from the region about Canyon Lake, Arizona, and from extreme southeastern California along the western border of the Colorado River, *tumidus* has been given subspecific status under Baird's older name *obesus*. Although the type locality of *obesus* was stated to be Fort Yuma, California, an area of intergradation, the type specimen has the scale counts of a typical *obesus*. Whether the type specimen was actually collected at Fort Yuma or in the mountains to the west is a matter of question, because of the early practice of designating the shipping point of specimens as the locality at which they were collected.

Localities of Collection.—ARIZONA: *Yuma County*—Gila Mts. at Telegraph Pass (type locality), Gila Mts. at Tinajas Altas, Mohawk Mts. at U. S. 80; *Pima County*—Black Gap (15 mi. n. of Ajo), Alamo Canyon in Ajo Mts.; *Pinal County*—West end of Picket Post Mt. (near Superior), 4 mi. w. of Superior.

Sauromalus obesus obesus (Baird)

GREAT BASIN CHUCKWALLA

Euphryne obesus Baird, Proc. Acad. Nat. Sci. Phila., 1858, p. 253.

Euphryne obesa Baird, U. S. Mex. Boundary Survey, vol. 2, Rept., 1859, p. 6, pl. 27.

Sauromalus ater Cope, Bull. U. S. Nat. Mus., no. 1, 1875, p. 47.

Sauromalus obesus Schmidt (part), Bull. Amer. Mus. Nat. Hist., vol. 46, 1922, p. 641.

Type Specimen.—No. 4172 in the collection of the U. S. National Museum.

Type Locality.—Fort Yuma, California.

Distribution.—Southeastern California, southern Nevada, southern Utah, northern Baja California, and Arizona north of the line Yuma—Casa Grande—Canyon Lake.

Diagnosis.—Similar in size, coloration and lepidosis to *S. o. tumidus*, but with finer and usually less spinose scalation throughout, especially on the limbs

and tail. The ventrals range in number from 156 to 220 and average 186.8. The humerals vary from 46 to 68, averaging 54.7.

Description.—Form stout; the head and body much depressed, the latter with a strong lateral fold. The head is wider than long in adult males and longer than wide in females and juveniles. The top of the head is covered with small, smooth plates, largest on the frontal and parietal regions. The supraoculars and superciliaries are small and juxtaposed. The nostril is pierced in a single rounded plate much nearer the tip of the snout than the orbit. The rostral plate is usually divided vertically into two scales of equal size and shape although these may occasionally be united to form a single hexagonal plate much wider than high. There is a series of weakly carinate rectangular suboculars, which, posterior to the eye, pass upward and backward to the ear opening in the form of tubercles. The labial plates are small and subequal. Below the infralabials there are several series of sublabials which merge gradually into the granular gular scales. There is a strong gular fold. The ear opening is vertical, or nearly so, with an anterior denticulation of from two to four strongly spinose elongate scales. Behind the ear opening there is a prominent neck fold bearing tubercles or subconical spines. The nuchal scales are occasionally strongly spinose but more often may consist of a flattened scale with one corner projected into a weak spine. A broad median band of enlarged and weakly spinose scales extends from between the shoulders to the rump. Laterally, the scalation is much finer, becoming enlarged and spinose on the lateral fold. The ventral scales are smaller than the middorsal scales. Between the gular fold and the anus there are from 156 to 220 rows of scales, averaging 186.8.

Dorsally, the scalation of the forelimb is relatively coarse, occasionally carinate and weakly spinose. There are from 46 to 68 rows of humeral scales, averaging 54.7. Below, the scalation is granular and much reduced in size.

The scalation of the dorsal surface of the femoral part of the hindlimbs is coarser than that of the corresponding part of the forelimb, more or less obtusely spinose and carinate; below, much reduced in size.

The tail ranges from 48 to 54 per cent of the total length. The scalation consists of rather small, bluntly spinose, carinate scales, except dorsally and ventrally at the base, where it is only weakly spinose and usually smooth. The scalation becomes coarser and more spinose and carinate towards the tip of the tail. There are from 30 to 42 scales in a whorl two head lengths behind the vent, averaging 35.9.

Variation.—In *obesus* coloration and scalation are quite variable, both geographically and individually. There is also sexual variation. Generally the coloration of the adult males consists of a black head, neck, shoulders, chest and limbs. These may either be solid black or more or less profusely spotted with gray or white. The remainder of the body may range in color from a nearly unicolor black to a light-gray or red. In most adult males some traces of the transverse bands are usually present, but there are frequent exceptions to this. Females are usually grayish in color with darker head and limbs, and usually retain the juvenile pattern of transverse body bands. There

may be small and infrequent spots or dashes of orange or red dorsally on the body, but the females lack the general reddish suffusion found in most of the males from western Arizona and eastern California.

Many adult males of *obesus* from Arizona and extreme eastern California exhibit the same type of coloration as reported for *tumidus*, that is, with head, chest, neck, and legs black and occasionally spotted with gray, the remaining dorsal surface of the body having a yellowish or grayish ground color, well suffused with red and spotted or reticulated with black. The belly is a uniform red with more or less dense black spotting. The reddish suffusion seems to be most prevalent among the large males from Arizona and southern Nevada, and westward into eastern California a short distance, although in specimens from the latter area the red is usually not so extensive nor as brilliant. In specimens from western Imperial County and the eastern slope of the Coast Range in San Diego and Riverside counties, the reddish coloration is lacking. Specimens from the Palm Springs region of Riverside County are without the reddish suffusion, while directly across the Coachella Valley in the Little San Bernardino Mountains the reddish coloration suddenly appears. LMK 31900, a handsome male from Fargo Canyon, Little San Bernardino Mts., has a straw-yellow ground color, dorsally overlain with vivid red reticulations and a fine spotting of black. The belly is also red, spotted with black. The top of the head, gular region, chest and limbs are gray, spotted with black. The tail is straw color without any traces of rings.

A series of specimens from the Mountain Springs region of Imperial County and the Borego Desert area of San Diego County, California, shows that the adult males are quite similar in coloration to the adult males of *tumidus* from the Gila Mts., Yuma County, Arizona, except that the area between the head and hindlimbs is a light-gray with or without traces of cross bands.

Some specimens from Inyo and San Bernardino counties are quite dark and show tendencies toward melanism like the *obesus-tumidus* intergrade from Apache Junction, Arizona. LMK 34218, from 6 mi. nw. of Panamint Spring, Inyo County, has a jet-black ventral surface, while a large part of the dorsal surface of the head, body and limbs is also black, except for a grayish spotting. The tail is yellowish-gray with three darker bands.

The juvenile coloration in *obesus*, as well as in *tumidus*, is quite different from that of adults and the pattern is much more clearly defined. The following notes were made from a specimen 115 millimeters in length from Coyote Mountain, Imperial County: The top and sides of the head are Wood Brown becoming Fuscous on the occipital region. There is a Black spot immediately anterior to the ear opening. The nape is Blackish Mouse Gray with a short median dash of Apricot Orange. The gular region is Deep Mouse Gray. The belly is an immaculate Pale Olive Gray. Dorsally, the ground color of the body is Prouts Brown. There are three transverse bands of Chaetura Black between the shoulders and the rump. In the interspaces between the bands are middorsal streaks of Pale Yellow-Orange. On either side of these streaks there are several subcircular spots of the same color.

Laterally the ground color is Light Pinkish Cinnamon, with scattered spots of Pale Smoke Gray. The dorsal surface of the fore limb is Mouse Gray becoming Light Vinaceous Cinnamon on the toes. The dorsal surface of the upper part of the hind limbs is Deep Mouse Gray irregularly marked with Blackish Mouse Gray. On the tail the first ring is Saccardo's Umber with Fuscous-Black anterior and posterior edges. The remaining three tail rings are Black. The interspace between the first and second bands is Pale Yellow-Orange, the other two being White.

The most complete account of color changes as influenced by light and temperature in this lizard is that of Dr. Sarah R. Atsatt (1939, pp. 249-50). This author's conclusions follow: "Experimentally, *Sauromalus obesus* parallels *Phrynosoma* in its responses to temperature and light. At high temperatures the light phase appears irrespective of illumination; at low temperatures the dark phase appears irrespective of darkness. At moderate temperatures the lizard is dark when subjected to bright illumination and in the light phase when subjected to darkness.

"The speed of the reactions in *Sauromalus* is much like that of *Phrynosoma*. At 28-33° C. in bright light, the process of darkening begins in from five to fifteen minutes and in thirty minutes shows marked progress but often is not complete. At higher temperature, however, the change is rapid—one individual changed from medium dark to light in ten minutes in darkness at 41-38° C. For lower temperatures, 20-25° C., the change is less for a given length of time, and at these temperatures the paling process rarely reaches completion. If the animals have been at a low temperature (below 20° C.) overnight, and are put in a moderate temperature of 32° C., *Sauromalus*, because of its bulk, takes a longer time than *Phrynosoma* to reach the temperature at which illumination is the controlling factor. *Sauromalus* begins to respond to high temperature around 35° C. and reaches the very light phase only at 40° C. and higher.

"The change in the distinctness of the tail bands, recorded by Stejneger (1893, p. 174) as due to intensity of light may also be due to change in temperature. The change recorded by Van Denburgh (1922b, p. 89) is definitely in response to excitement."

The variation in scalation is also quite considerable in *obesus*. The majority of specimens of *obesus* lack the degree of spinosity achieved by *tumidus*, but occasional specimens of *obesus* have been found in which spines were quite well developed on the nuchal region, the postauricular fold and on the caudal scales. *Obesus* generally lacks the well-developed keels present on the scales of the dorsal surfaces of the limbs of *tumidus*.

The variation in scale counts found in 40 specimens of *obesus* from the Mountain Springs region of Imperial County and the Borego Desert area of San Diego County, California, is shown below:

	Ventrals	Caudals	Humerals
Range	165-215	30-41	50-61
Mean	189.3	36.9	54.5
Standard deviation	10.58	2.58	3.06
Coefficient of variation, per cent	5.59	6.97	5.63

Habits.—The following notes on the habits of *obesus* will undoubtedly apply equally as well to the closely related *tumidus*.

Obesus, like the other species of the genus, is herbivorous. An examination of the stomach contents of specimens has revealed the blossoms and leaves of the following plants: *Phacelia* sp.; *Franseria dumosa*; *Encelia farinosa*; *Eriogonum* sp.; *Ditaxis lanceolata*; *Larrea divaricata*; *Fouquieria splendens*; *Lotus strigosus*; *Cryptantha* sp.; *Chaenactis* sp.; *Salvia columbariae*; *Tropidocarpum gracile*; *Dalea fremontii*; *Leptosyne bigelovii*; *Amsinckia tessellata*; *Sphaeralcea munroana*; *Ephedra viridis*; and *Euphorbia polycarpa*.

In the Borego area of San Diego County two specimens were found in a crack in a large boulder, from the base of which led a well-traveled path to an ocotillo (*Fouquieria splendens*) about fifty feet distant across the sandy bottom of a dry wash. The stomachs of these two chuckwallas were filled largely with the brilliant red blossoms of the ocotillo, showing that chuckwallas do not hesitate to leave their rocky retreats in search of food.

Near Kingman, Mohave County, Arizona, a chuckwalla was observed perched in the top of a bush about two feet high, eating with slow and deliberate movements the yellow blossoms. Another specimen in the same attitude was observed and collected near Quartzsite, Yuma County. Neither of these specimens was bothered by my presence and I approached to within twenty feet of them before shooting.

The best time for collecting chuckwallas is early in the morning just after they have emerged from the rocks to sun themselves and to eat. Specimens may be collected by shooting or by extracting them from the rock crevices in which they seek shelter. The former is by far the easiest method but it is not always a simple matter to get within shooting range. They may be shot while in the rock crevices although the narrow opening of the crevice, together with the nearness of the muzzle of the gun, concentrates the shot so that a badly mutilated specimen is usually the result.

If a live specimen in good condition is sought, the chuckwalla may usually be extricated from the crevice, in which it tightly wedges itself by inflating the lungs, by tapping it gently on the nose. This annoyance usually causes it to back out of the crevice far enough so that it may be seized by the base of the tail or a leg. It is said that the Indians, who used these lizards for food, secured them by puncturing them with sharpened sticks and then withdrawing the lizard from the crevice. Using a heavy, sharpened wire, I tried this technique on a specimen at Borego Mountain in San Diego County. The lizard was punctured eight or nine times all along one side but there was no appreciable deflation.

Practically nothing is known of the breeding habits of this or any other species of *Sauromalus*. A specimen taken 7 mi. w. of Townes Pass, Inyo County, during the middle of May, contained nine eggs which were apparently about ready to be laid. Bogert (1930, pp. 6-7), who collected fourteen chuckwallas at Lovejoy Buttes, Los Angeles County, on May 11 and 12, 1929, found six eggs in an average sized female. This author also states: "In three cases male and female found side by side in cracks were apparently mating."

Occasionally specimens are found DOR in such places as at Sentenac Canyon, San Diego County, and at Telegraph Pass, Yuma County, Arizona. This would indicate that chuckwallas do not confine their activities to rather limited areas, such as a particular pile of rocks, but at times probably travel considerable distances in search of food or mates. Neither do they confine themselves to the boulder strewn slopes of desert hills and ranges proper, for if sufficient rocky debris is available they are occasionally found nearly a mile from the nearest mountains, as in the vicinity west of the Black Mountains in Mohave County, Arizona, where a large amount of rocky debris is found on the plain which slopes away from the base of this range. In this locality chuckwallas were found in scattered piles of rocks together with *Callisaurus v. ventralis* and *Dipsosaurus d. dorsalis* which inhabit the open, sandy areas of the desert.

The following remarks by Bogert (*loc. cit.*) are of interest: "In the early part of April, 1928, a large adult male chuckwalla was collected at Lovejoy Buttes. It had just come out of hibernation and was very thin. After about a month and a half of captivity it was liberated May 26, 1928, at a spot twenty feet from the crack in which it had originally been discovered. Then on May 11, 1929, nearly a year later, the identical specimen was re-collected when found between two rocks possibly twelve feet from the crack where it had been originally found. It was easily identified by means of a peculiar scar on its back. Also it was much thinner than any other of the fourteen chuckwallas collected on that week-end."

Localities of Collection.—CALIFORNIA: *Inyo County*—7 mi. s. of Saline Valley, 7 mi. w. of Townes Pass, 5 mi. sw. of Townes Pass, Emigrant Spring, Wildrose, Pleasant Canyon in Panamint Mts., Darwin (also 7 and 9 mi. east), 1 mi. n. of Little Lake, Little Lake, 17 mi. n. of Trona, Slate Mts., Shoshone; *San Bernardino County*—Saltwells Valley, 6 mi. nw. of Spangler, Deadman's Point, Cave Springs, Victorville, Oro Grande, Barstow, 14.6 mi. ne. of Barstow, Odessa Canyon in Calico Mts., Minneola, Cat Mountains, Baxter, s. end Soda Lake Mts., 7 mi. sw. of Baker, Silver Lake, 5 mi. sw. of Ivanpah, Sacramento Mts. (28 mi. w. of Needles), Piute Mts. (16 mi. w. of Needles), Essex, 8½ mi. nw. of Essex, 5 mi. s. of Lavic, 4 mi. s. of Lavic, Hector, Lucerne, Twenty-nine Palms, 10 mi. ne. of Blythe Junction, Rabbit Dry Lake; *Kern County*—17 mi. e. of Inyokern, Red Rock Canyon (20 mi. n. of Mohave), Red Hill; *Los Angeles County*—Lovejoy Buttes, Peck's Butte; *Riverside County*—Snow Creek, 4 mi. w. of Garnet, Palm Springs, 5 mi. e. of Palm Springs, 1 mi. sw. of Palm Springs, 5 mi. se. of Palm Springs, 4 mi. nw. of Palm Springs, Tahquitz Canyon, Palms to Pines Highway at 3100 feet, Dos Palmas Springs in Santa Rosa Mts., 5 mi. ne. of Edom, Cottonwood Springs, near jct. Dead Indian and Grapevine Creeks, Coral Reef Canyon, Murray Canyon, Fargo Canyon in Little San Bernardino Mts., Berdoo Canyon in Little San Bernardino Mts., Pushawalla Canyon in Little San Bernardino Mts., Shaver Well, Hidden Spring Canyon, Rice, Riverside Mt., Desert Center, 16 and 8 mi. e. of Desert Center, Chuckwalla Mountains; *Imperial County*—Pilot Knob, Ogilby, American Girl Mine, Chocolate Mts., Fort Yuma (type locality), near Imperial Dam, Picacho Landing, 12 mi. sw. of Palo Verde, Beal Well,

Hanlon Ranch, Coyote Mts., foot of Mountain Spring Grade, Myer's Creek Bridge, Mountain Springs; *San Diego County*—Agua Caliente Hot Springs, Mason Valley, Box Canyon, Sentenac Canyon, Yaqui Well, San Felipe Wash, The Narrows, Tubbs Canyon, Coyote Canyon, Borego Mountain, 4 mi. s. of Benson's Dry Lake. ARIZONA: *Mohave County*—Hackberry, Kingman, Goldroad, between Oatman and Goldroad, Oatman, 1, 3 and 4 mi. sw. of Oatman, 16 mi. ne. of Topock, Chemehuevis Mountains; *Yuma County*—8 mi. w. of Brenda, 5 mi. w. of Brenda, 2 mi. e. of Hope, Dome Rock Mts. (8 mi. w. of Quartzsite), Quartzsite, Castle Dome, Kofa Mts.; *Coconino County*—Below Indian Gardens in Grand Canyon; *Maricopa County*—Wickenburg, 7 mi. sw. of Wickenburg, Tempe, Stewart Mt. (near Mesa), Maricopa Mts. at U.S. 80; *Yavapai County*—5 mi. n. of Wickenburg, near Congress Junction. NEVADA: *Clark County*—W. bank of Colorado River (1/6 mi. north of California line), Searchlight, Boulder City, island in Lake Mead, Boulder Wash, Las Vegas Wash, 12 mi. w. Las Vegas, 68 mi. nw. Las Vegas between Indian Springs and Amargosa, 9½ mi. s. of Dead Mts., 2½ mi. e. of St. Thomas, Atlatl Rock in Valley of Fire, 2½ mi. e. of Hiko Spring, Hiko Spring; *Nye County*—Rhyolite, southeast end of Spectre Range. UTAH: *Washington County*—St. George, Black Ridge, Silver Reef (21 mi. ne. of St. George); *San Juan County*—Aztec Creek; *Kane County*—Rock Creek, Warm Creek.

SUMMARY OF CHARACTERS OF THE SPECIES AND SUBSPECIES OF *Sauromalus*

	Number of specimens	Ventrals	Caudals	Humeralis	Dorsal scales in head length	Femoral pores	Tail length/total length	Pattern
<i>S. hispidus</i>	11	108-121.4-129	23-25.5-28	31-35.6-38	16-18.2-21	13-14.9-17	.496-.516-.538	Adults unicolor dark-brown above or nearly so; juveniles with from 1 to 5 transverse bands.
<i>S. strevini</i>	17	107-115.8-123	22-22.3-23*	30-33.8-37	20-23.5-28	12-14.5-18	.524-.540-.565	2 to 4 dark-brown or black transverse bands, or at least evidences of these.
<i>S. klauberi</i>	3	128-130.3-132	24†	36-37.7-39	26-28.0-31	17-18.2-19	.532†	Finely spotted with dark-brown or black.
<i>S. ater</i>	18	130-139.8-151	24-28.3-33	35-40.2-45	24-28.0-32	17-18.7-21	.500-.533-.553	4 or 5 dark-brown or black transverse bands.
<i>S. australis</i>	6	151-163.5-186	32-34.7-37	46-49.0-55	29-31.3-33	15-17.6-20	.542-.550-.558	4 or 5 dark-brown or black transverse bands.
<i>S. varius</i>	11	150-158.5-165	30-32.0-35	52-54.3-58	30-32.0-35	15-16.1-18	.507-.527-.560	Irregularly blotched with dark-brown or black.
<i>S. o. townsendi</i>	11	138-148.7-157	27-28.5-30	37-40.4-45	27-30.0-34	13-15.4-18	.491-.514-.550	4 or 5 dark-brown or black transverse bands.
<i>S. o. tumidus</i>	31	132-159.4-190	29-32.4-37	39-44.6-50	27-30.4-37	14-17.2-21	.463-.504-.543	Adult males with dorsal and ventral reddish suffusion; females and juveniles with from one to four dark-brown transverse bands.
<i>S. o. obesus</i>	157	156-186.8-220	30-35.9-42	46-54.7-68	27-33.0-42	12-17.1-22	.481-.505-.540	3 or 4 dark-brown or black transverse bands, except in adult males which usually lose these.

* 4 specimens only

† 1 specimen only

KEY TO THE SPECIES AND SUBSPECIES OF *Sauromalus*

1. One or more transverse bands dorsally, across body or rump..... 4
 No transverse body bands present..... 2
2. Largest nuchal scales equal to or larger than the frontal plates
*S. hispidus* (adult)
 (Angel de la Guarda, Smith, Pond, Granite, and Mejía Islands, Gulf of California,
 Mexico.)
 Largest nuchal scales smaller than the frontal plates..... 3
3. Dorsal pattern of large, irregular, dark-brown or black blotches on a yellowish
 ground color.....*S. varius*
 (San Estéban Island, Gulf of California, Mexico.)
 Dorsal pattern of small, dark-brown or black spots on a gray ground color
*S. klauberi*
 (Santa Catalina Island, Gulf of California, Mexico.)
4. Ventral scale rows usually less than 130..... 5
 Ventral scale rows usually more than 130..... 6
5. Dorsal scales in a head length usually less than 20.....*S. hispidus* (juvenile)
 (Angel de la Guarda, Smith, Pond, Granite, and Mejía Islands, Gulf of California,
 Mexico.)
 Dorsal scales in a head length usually more than 20.....*S. slevini*
 (Carmen, Coronado, and Monserrate Islands, Gulf of California, Mexico.)
6. Transverse body bands with light centers and dark-brown or black borders
 giving a "double" banded effect..... 9
 Transverse bands unicolor..... 7
7. Humeral scales usually less than 50..... 8
 Humeral scales usually more than 50.....*S. o. obesus*
 (Deserts of southeastern California, southern Nevada, southern Utah, northern Baja
 California, and Arizona north of the line Canyon Lake—Casa Grande—Yuma.)
8. No reddish suffusion on the dorsal and ventral areas in the adult males;
 maximum adult length averaging somewhat shorter than in *S. o. tumidus*
 and lower average scale counts.....*S. o. townsendi*
 (Tiburón Island, Gulf of California, and adjacent Sonoran mainland at least as far
 south of Guaymas.)
 More or less brilliant reddish suffusion on the dorsal and ventral areas of
 adult males; maximum adult length averaging longer than in *S. o. townsendi*
 and higher average scale counts.....*S. o. tumidus*
 (Arizona south of the line Canyon Lake—Casa Grande—Yuma.)
9. Ventral scale rows 151 or more.....*S. australis*
 (Central and southern Baja California from San Francisquito Bay south to La Paz.)
 Ventral scale rows usually less than 151.....*S. ater*
 (Espíritu Santo, Isla Partida, San Marcos, San Diego, San Francisco, and Santa Cruz
 Islands, Gulf of California, Mexico.)

MUSEUM ABBREVIATIONS

Where specimens have been referred to by number the following abbreviations have been used:

CAS	California Academy of Sciences
Chi.A.S.	Chicago Academy of Sciences
LMK	Private collection of L. M. Klauber
SDSNH	San Diego Society of Natural History

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